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THESIS

CASE STUDIES OF MERGER ACTIVITY IN THE DEFENSE INDUSTRY SINCE 1993

by

Gary R. Zegley

June, 1997

Thesis Advisor: O. Douglas Moses
Associate Advisor: Gordon E. Louvau

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To cope with a shrinking defense budget, the U.S. defense industry has undergone an unprecedented wave of consolidation. Since 1993, Moody's Investors Service has counted over 20 defense industry mergers and acquisitions. Reasons given for the consolidation include achieving critical economies of scale and combining complementary resources in a bid to remain competitive in a capital intensive industry. This thesis examines the financial impact of three merger/acquisition events: Northrop's purchase of Grumman, Lockheed's merger with Martin Marietta, and Raytheon's acquisition of E-Systems. Analysis is conducted to assess financial condition as revealed in an examination of financial ratios and financial prospects as revealed in an examination of market value and market returns. Financial condition of the firms was marked a decline in relative profitability and a degradation in solvency for those that made purchase type acquisitions. Despite negative impacts to many financial performance measures, stocks of these companies achieved total returns in excess of the Standard and Poor's 500 index in the year of the merger event. Price earnings ratios also increased in relation to the S&P 500 P/E, showing that investors may have looked past short term costs of restructuring for longer term gain as a result of the consolidation.

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CASE STUDIES OF MERGER ACTIVITY IN THE DEFENSE INDUSTRY SINCE 1993

Gary R. Zegley
Captain, United States Marine Corps
B.S., Drexel University, 1990

Submitted in partial fulfillment of the
requirements for the degree of

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from the

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ABSTRACT

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To cope with a shrinking defense budget, the U.S. defense industry has undergone an unprecedented wave of consolidation. Since 1993, Moody's Investors Service has counted over 20 defense industry mergers and acquisitions. Reasons given for the consolidation include achieving critical economies of scale and combining complementary resources in a bid to remain competitive in a capital intensive industry. This thesis examines the financial impact of three merger/acquisition events: Northrop's purchase of Grumman, Lockheed's merger with Martin Marietta, and Raytheon's acquisition of E-Systems.

Analysis is conducted to assess financial condition as revealed in an examination of financial ratios and financial prospects as revealed in an examination of market value and market returns.

Financial condition of the firms was marked by a decline in relative profitability and a degradation in solvency for those that made purchase type acquisitions. Despite negative impacts to many financial performance measures, stocks of these companies achieved total returns in excess of the Standard and Poor's 500 index in the year of the merger event. Price earnings ratios also increased in relation to the S&P 500 P/E, showing that investors may have looked past short term costs of restructuring for longer term gain as a result of the consolidation.

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I. INTRODUCTION

A. BACKGROUND

The United States has assumed the role of the world's sole superpower in the decade of the 1990's. After the fall of the Soviet Union and an overwhelming victory over Iraq's forces in the Persian Gulf War, no adversaries exist who can credibly challenge U.S. military power. With the absence of any major threat to the nation's security, as well as an increasingly critical need to address the problems of the national budget, politicians and citizens of the United States see this period in history as an opportunity to realize the "peace dividend" by scaling back expenditures on national defense. Indeed, real spending for defense has declined by about 25% since 1990 and will most likely remain at a constant $250 billion dollars annually for the foreseeable future. Contractors and corporations that sell products and services to the Department of Defense (DoD) have felt this decline most strongly. Facing an unsure future and a struggle for survival in this shrunken market, these companies continue to explore ways to cut costs through vertical integration, reduction of overhead, and mass layoffs as a means of ensuring their existence.

In this austere budget climate of the 1990's, the government recognized there was a problem: The defense industry needed a major restructuring in order to remain profitable. At a dinner with defense company executives in 1993, Defense Secretary William Perry spoke of the need for a "major consolidation." The executives apparently took his comments seriously. Since then, Moody's Investors Service has counted over 20 defense industry mergers and acquisitions (Cole, 1996). A dramatic transformation has occurred, reducing the number of companies to a handful of huge firms. These giants will provide much of the nation's defense base for years to come, so their financial strength and continued existence is meaningful. These factors, the collapse of communism in eastern Europe and disintegration of the Soviet Union, the subsequent reductions in the U.S. defense budget, and the scramble to restructure have brought the defense industry to its current position.

B. OBJECTIVES AND RESEARCH QUESTIONS

This study will investigate the effects of three of the most significant recent mergers and acquisitions in the defense industry to determine whether they improved the firms' financial condition and whether they increased value for shareholders.

1. Primary Research Question

What has been the financial impact of selected major mergers in the defense industry since 1993?

Two aspects of financial impact will be examined: financial condition and financial prospects. Financial condition will be examined by an analysis of financial ratios. Financial ratios are calculated from financial accounting data and thus reflect the historical performance of the firm.

Financial prospects will be examined by an analysis of market value and returns. Market valuation is calculated with price earnings ratios and show investors' expectations for a company. Market returns are calculated from market stock price data and thus conceptually reflect future prospects of the firm.

2. Secondary Research Questions:

What was the financial condition of the firms before the merger? After the merger? How did the merger/acquisition affect financial condition?

What was the performance of the companies' stocks before the merger? After the merger? How did the merger/acquisition affect the stock market's assessment of future prospects?

C. METHODOLOGY

Six steps provide the foundation for this study:

1. Review of the pertinent literature.
2. Selection of the sample companies.
3. Collection of data.
4. Analysis of financial condition using financial ratios:
    a) Selection of financial ratios to be used.
    b) Calculation of financial ratio measures.

c) Comparison of ratio measures to industry norms.

d) Comparative analysis of ratio values before and after the mergers.

5. Analysis of financial prospects using stock prices:

a) Selection of stock performance data to be used.

b) Calculation of performance measures.

c) Comparison of performance measures to overall market performance.

d) Comparative analysis of stock performance measures before and after the mergers.

6. Synthesis of qualitative and quantitative information into a written analysis.

This study chose selected mergers from reviews of the defense industry and major defense contractors in the Wall Street Journal and Defense News. Companies were chosen that had large revenues, with a significant percentage of those revenues coming from defense sales. Emphasis was placed on companies that had had a distinct merger or acquisition event since 1993 that could be readily dissected. To avoid the problem of disentangling the effects of multiple acquisitions and enable the analysis to focus on a particular merger or acquisition, companies that had made numerous smaller acquisitions in a short time period were excluded. Northrop Grumman Corporation, Lockheed Martin Corporation, and Raytheon Corporation met these requirements best.

The data was collected from annual reports, Moody's Industrial Reports, industry analysts' reports, and Standard and Poor's stock price histories from the years 1990 to the present. Balance sheets, income statements, statements of cash flows, and stock price histories were the primary source of data.

D. SCOPE, LIMITATIONS, AND ASSUMPTIONS

The broad objective of this research is to look at the results of these mergers as reflected in financial condition as measured by comparison against ratios for the defense industry and value as determined by the stock market. Ultimately, the intent is to

determine how the financial condition of the new companies has changed and observe how the companies' stock prices have responded in relation to the market.

This thesis will be an analysis of selected mergers since 1993, not an exhaustive statistical study of the entire defense industry. It will be a firm-by-firm analysis that attempts to assess selected effects of the industry consolidation brought about by the defense drawdown.

E. ORGANIZATION OF STUDY

Chapter II contains defense industry background and a review of the literature used. Chapter III contains a discussion of the research methodology and data collection techniques as well as an explanation of the analysis performed. Chapters IV, V, and VI present the data and analyze the results for each of three separate mergers, answering the research questions outlined in section B above. Chapter VII concludes the thesis with a summary, conclusions, and recommendations for further study.

II. BACKGROUND AND LITERATURE REVIEW

A. BACKGROUND

1. Catalysts for Change

With the military buildup and healthy defense budgets of the 1980's, the defense industry operated at full capacity. Dozens—if not hundreds—of companies competed in a thriving defense industry that enjoyed what appeared to be never-ending profits. But the subsequent decline in defense spending has markedly changed the nature of the industry; the near future doesn't look quite as promising. Military sales will continue to slump, down about 6% from 1996 levels. Adjusted for inflation, that's less than half of the 1987 spending peak. (Darlin, 1997) Consensus on the part of both business and government has been that significant streamlining and economies of scale must be achieved through consolidation in the industry. This can be seen in the results: The number of major players in the industry has shrunk to about five companies.

The move toward size and swallowing up suppliers contrasts with the trend elsewhere in industry, toward streamlining and contracting with suppliers for many parts and services. Defense companies argue that they are different; at a time of declining defense spending, executives argue that they need to be huge in order to win contracts. (Cole, 1996)

With U.S. military spending having dipped over the past five years, shareholders, as well as the Pentagon and other federal agencies are keeping a close watch on big mergers. Both private and government parties have a stake: Shareholders want to be sure that the mergers and acquisitions are being made with an eye to increasing value to them. Meanwhile, the government seeks to maintain a viable defense industrial base, prevent antitrust violations, and ensure that potential monopolies do not drive up the price of weapons.

2. The Industry Consolidates

"Unprecedented" is probably the word that best describes the nature of the restructuring that the U.S. defense industry has undergone—and is still undergoing.

Here's a look at the major action, starting in 1993:

- 1993:
  - Lockheed purchases General Dynamics fighter businesses for $1.5 billion.
  - Martin Marietta acquires General Electric's aerospace businesses for $3.05 billion.

- 1994:
  - Loral acquires IBM Federal Systems Co. for $1.58 billion.
  - Martin Marietta buys General Dynamics space division for $200 million.
  - Northrop buys Grumman for $2.17 billion.
  - Northrop Grumman acquires remaining 51% of Vought Aircraft Co. for $130 million.

- 1995:
  - Lockheed merges with Martin Marietta to form the new Lockheed Martin through an exchange of common stock worth $10 billion.
  - Loral buys Unisys Corporation's defense businesses for $862 million.
  - Raytheon acquires E-Systems for $2.3 billion.
  - Boeing acquires Precision Gear.

- 1996:
  - Lockheed Martin acquires most of Loral for $9 billion.
  - Boeing acquires Rockwell International Corp. for $3.2 billion.
  - Boeing announces intention to acquire McDonnell Douglas for Corp. for $13.3 billion.
  - Raytheon acquires one of Chrysler's defense businesses for $455 million.
  - Northrop Grumman buys defense electronics division of Westinghouse for $3 billion.

- 1997:
  - Raytheon announces plans to acquire the defense electronics business of Texas Instruments for $2.95 billion.
  - Raytheon intends to acquire GM's Hughes Aircraft for $9.5 billion in stock and debt.
  - Northrop Grumman agrees to buy Logicon Incorporated in a stock

transaction valued at $750 million, or $52 a share.

B. LITERATURE REVIEW

A great deal of business literature has explored the motivation, execution, and results of mergers and acquisitions. Mergers and acquisitions occur within a dynamic environment and for a variety of reasons. Much of the literature begins with asking basic questions regarding mergers and acquisitions, then delves into an analysis of the issues via financial data.

1. What Motivates Firms to Restructure via Mergers and Acquisitions?

This is one of the main questions investigated in mergers and acquisition literature. Foster (1986) classifies the reasons behind such decisions into one of two categories:

- To maximize the market value of equities held by existing shareholders.
- To maximize the welfare of existing management.

Foster's analysis, while concise, is rather limited in detail. Most readers understand that mergers are professedly undertaken to improve a company's prospects—and management may benefit in the process. Often this is probably the case. And certainly, viewed with the benefit of hindsight, some mergers were arguably done to expand the assets under management's control, helping to ensure its future. But while pointing out that some mergers are undertaken to maximize shareholder value, Foster leaves the details of how this could be done to the reader.

Palepu, Bernard, & Healy (1996) go beyond Foster's identification of maximizing market value by citing the following reasons for mergers and acquisitions:

- Take advantage of economies of scale.
- Improve target management.
- Combine complementary resources.
- Capture tax benefits.
- Provide low-cost financing to a financially constrained target.
- Increase product market rents.

Just as importantly, Foster says that companies often decide to merge for reasons that at first seem to be sensible, but later prove to be unwise. One example of this is a

company which sees itself as flush with cash. Rather than pay dividends, management seeks to maximize resources under their control. Here again, the point is that acquisitions made solely to increase management's power base are usually ill advised. A company may also feel that it needs to diversify. Management attempts to smooth period-to-period earnings by buying firms in unrelated businesses. After the diversification heyday of the 1980's, most analysts believe that investors can better diversify on their own; an individual investor can buy shares of a company in an unrelated business far easier than most companies can integrate an awkward acquisition—especially one from a different industry—into an existing corporate entity.

2. What Have We Learned From Mergers and Acquisitions of the Past?

a. Lowenstein

Students of business know that mergers have at times been "fashionable" throughout history, sending the stock market into frenzies as speculation bid up prices. Louis Lowenstein (1988) attributes one spate of mergers and acquisitions to the emergence of a clever idea in the 1960's: Bring several companies under one single roof; improved management techniques and low cost financing could then be brought to economically unsophisticated businesses. Academics built elaborate theories to explain the efficiencies of the conglomerate form while companies like ITT Corporation acquired not just one or two, but sometimes hundreds of separate businesses. Litton, Commonwealth United, Whittaker, Gulf & Western subscribed to the philosophy as well. In some cases, solid management skills backed up the buys, but most were conglomerates in form only. The stock market gushed with praise via substantial price valuations, but over the long term, the market demanded steady earnings increases. Various accounting techniques and gimmicks met that demand for a while, but eventually companies learned that it was difficult to manage even a core handful of businesses.

ITT led the way to the exit door and sold off businesses by the dozen. With the benefit of hindsight, there was little to show for all the effort. Earnings had grown at first, but the heavy debt and the difficulty of managing hundreds of diverse businesses took their toll. Stock prices DID rise—for a while, but over time the romance

faded and stock prices caved in.

Again, during the 1980's a wave of mergers and acquisitions swept American industry. The stock market enthusiastically rallied around each takeover. Companies found themselves running businesses that were out of their area of expertise, like Mobil Corporation when it bought retailer Montgomery Ward. Peter Lynch, former manager of Fidelity's Magellan mutual fund and financial author, called such moves "diworseification," a contemptuous term for the hasty, poorly planned attempts at diversifying a corporation's revenue base. Like the 1960's, most of the acquiring companies eventually found themselves more than happy to unshackle themselves from the same darlings that had held such promise at one time.

b. Loughran and Vijh

Via the market value of their holdings, investors who hold stock in a company are affected by mergers and acquisitions. In theory, if the acquisition is of positive value to the company, the company's stock performance should improve. But since mergers and acquisitions can be financed in different ways, this last statement does not lend itself to a simple assessment.

Roger Lowenstein (1997) discusses a study by Tim Loughran and Anand M. Vijh of 1,000 mergers from the 1970's and 1980's, looking particularly at how the mergers were conducted—with cash or with the issuance of stock. He found several conclusions:

- Companies that made cash acquisitions saw their stocks rise an average of 113% in the five year period after the merger; those that used stock to finance the acquisition rose only 61%.

- Companies that made cash acquisitions did better than average, not just better than other acquirers; Acquirers that used stock did 24% worse than a neutral benchmark.

- Hostile acquirers' stocks outperformed the stocks of companies that made tender offers. Lowenstein believed that this was because hostile acquisitions allowed for immediate improvement just by replacing inefficient management.

C. SUMMARY

At a time of declining defense spending, government contractors are consolidating in order to streamline operations and achieve economies of scale. A series of significant defense mergers and acquisitions has occurred since 1993, concentrating power into the hands of the remaining large corporations.

These companies engage in mergers and acquisitions for a variety of reasons. Publicly, all the reasons tend to center around improving the value of company to its shareholders. However, management also has a stake in their companies (their own jobs and future financial compensation), so the motives behind such events may be suspect.

Mergers and acquisitions have occurred in the past in corporate America, and their results have been noted as being less than ideal. Often, companies acquired other firms that were not well suited to the parent company. Later, these same acquiring firms found themselves laden with debt and an acquisition that did not work well with current management structure.

Loughran and Vijh studied 1000 mergers that occurred during the 1970's and 1980's and concluded that companies that made cash acquisitions saw their stocks prices increase nearly twice as much as those that used stock to finance the acquisition; They also did better than the market average.

III. METHODOLOGY

A. OVERVIEW

This chapter details how this thesis was conducted. First, it gives an overview of the methodology used. It then describes how firms were selected for analysis, and the ratio and stock market measures that were used. Finally, the type of written analysis is disclosed, along with the assumptions that were made in conducting the analysis.

B. METHODOLOGY OUTLINE

This analysis was conducted as follows; additionally, Figure 1 on page 12 provides a graphic outline.

1. Descriptive overview of company, including recent merger and acquisition history.

2. Explanation of general circumstances of the merger.

3. Analysis of financial ratio data from 1990 to 1996. Financial ratio data was entered into an Excel spreadsheet program and compared to industry composite figures calculated from Dun and Bradstreet's Industry Norms and Key Business Ratios.

4. Study of stock price data before and after the merger. Analysis of a company's stock market data was viewed in relation to the Standard and Poor's 500 index so that the raw data is seen in relation to the overall market.

5. Written analysis that integrated the ratio and stock analysis with macro-level issues.

C. SAMPLE FIRMS

Firms were selected that met the following criteria:

1. They had large dollar contract awards as identified by the Defense 96 Almanac and were among the top ten of the Pentagon's annual list of firms ranked by prime contract totals.

2. They were clearly identifiable corporate entities, traded as wholly separate public companies before the merger, and continuing to trade publicly after the merger.

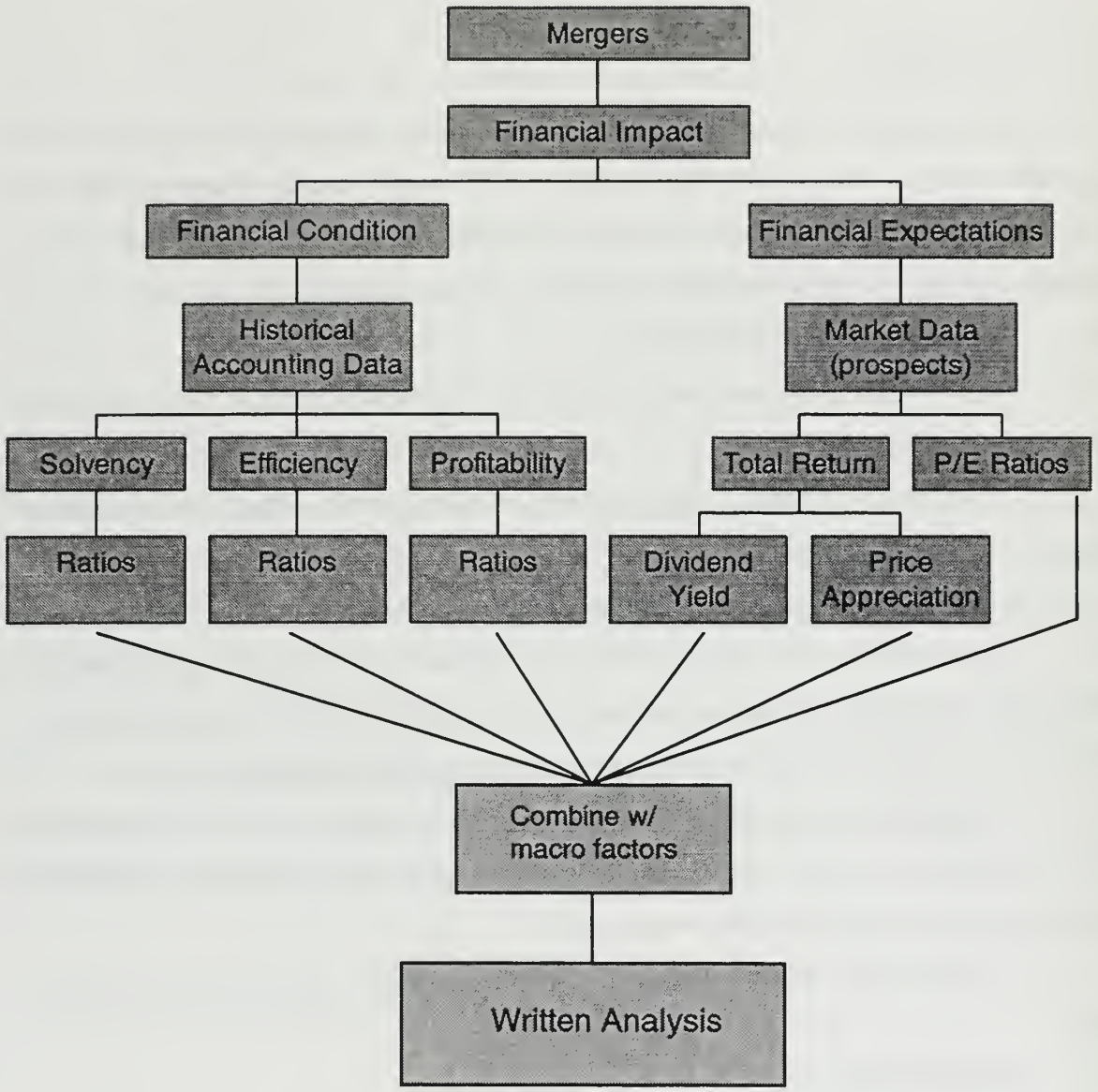

Figure 1. Overview of Thesis Methodology

3. The merger/acquisition event occurred at a time that provided adequate opportunity to distinguish the effects of the single event from other mergers and acquisitions that may have happened with one of the same companies. An attempt was

made to minimize excessive "background noise" of other merger/acquisition activities so that the study could focus on an individual merger event itself.

4. The stocks of the companies involved were part of the S&P 500 stock index both before and after the mergers.

Based on the above criteria, nine companies, comprising three different merger/acquisition situations were selected:

Pre-Merger Companies	*Post Merger Company*
Northrop and Grumman	Northrop Grumman Corporation
Lockheed and Martin Marietta	Lockheed Martin Corporation
Raytheon and E-Systems	Raytheon (w/E-Systems as a subsidiary)

D. MEASURES

The measures used to assess financial impact are developed from two different kinds of data, reflecting two different perspectives. Measures of financial condition (financial ratios) are constructed from financial accounting data. Financial accounting is specifically designed to record and summarize the past financial events of a firm, hence measures of financial condition developed from financial accounting data are primarily determined by the actual past operations of a firm. In contrast, stock prices set in the securities market are measures which are future oriented. In theory, stock value is determined by the future wealth a firm is expected to generate. Thus, expectations regarding a firm's future prospects are a primary item determining stock prices (and measures based on prices, such as total return and the price earnings ratio). In principle, it is possible for a firm to have been successful in the past (have "healthy" financial ratios), yet have poor prospects for the future ("low" market value). By creating financial measures from both accounting and stock price data, financial impact can be assessed both with respect to existing financial condition and future financial prospects.

E. FINANCIAL CONDITION DATA

1. Which Ratios Should Be Used?

Financial ratios are often used as a foundation of the business decision making process. Studies on the dimensions of financial condition explore the interrelationships and correlation among individual ratios. Financial ratios have typically been used to assess the performance of companies over time because performance and financial condition before and after a merger can be measured using them.

One could calculate hundreds of financial ratios, so it has been an objective for years to determine a smaller number of ratios that best reflect a company's position. The question arises: Which ratios should be used?

Two studies, one by Moses (1995) and another by one by White (1994) used a detailed factor analysis procedure that isolated common dimensions underlying financial ratios of the defense industry. Both studies concluded that a comprehensive analysis could be achieved using a small subset of common ratios.

Both of these studies used an analysis of a large segment of the defense industry in order to calculate the ratio items, but no comprehensive guide exists that contains industry averages for every conceivable ratio. Two publications, though, do provide industry averages and a snapshot in time of significant financial data: Industry Norms and Key Business Ratios, published by Dun and Bradstreet, and Standard and Poor's Industry Surveys. Containing data on hundreds of industries by standard industry classification (SIC), these references were used to compare the financial performance of the companies to the averages for their respective SIC. Ratios are organized as follows:

RATIO	CALCULATION
Solvency	
Quick Ratio	Cash + Accounts Receivable / Current Liab
Current Ratio	Current Assets / Current Liabilities
Current Liab to Stockholders Equity	Current Liabilities / Stockholders Equity
Current Liab to Inventory	Current Liabilities / Inventory

Total Liab to Stockholders Equity	Total Liabilities / Stockholders Equity
Fixed Assets to Stockholders Equity	Fixed Assets / Stockholders Equity

Efficiency

Collection Period	(Accounts Receivable / Sales) x 365
Sales to Inventory	Annual Net Sales / Inventory
Assets to Sales	Total Assets / Net Sales
Sales to Net Working Capital	Net Sales / Net Working Capital
Accounts Payable to Sales	Accounts Payable / Sales

Profitability

Return on Sales	Net Income / Net Sales
Return on Assets	Net Income / Total Assets
Return on Stockholders Equity	Net Income / Stockholders Equity

Several of the ratios used in both these publications are similar to the ratios noted by both Moses and White as particularly suitable for the defense industry. Because of the availability of published data, though, ratios obtained from Dun and Bradstreet serve as the basis for comparison for this study. To maintain consistency with Dun and Bradstreet's publication, the ratios for individual firms were calculated using their methods.

2. Procedures

Key financial data was entered into an Excel spreadsheet designed to automatically calculate the identified business ratios. These ratios were calculated both before a merger, and for the combined companies after a merger. As a means of judging what two companies' financial ratio data might look like after a merger, weighted average pro forma financial ratios were calculated for each merger in the year immediately preceding the event; total assets is used as the basis for calculating this data for newly combined firms.

Comparisons were made as to performance throughout the time period relative to the industry via the pro forma ratios and also by referencing a composite of industry ratio figures that was created for this purpose. This industry composite figure was an average of ratios for Dun and Bradstreet's standard industry codes (SIC's) 3721 (aircraft) and 3812 (search and navigation electronics). Since all companies analyzed in this thesis operate in one or both of these industry groups, these were chosen as representative industry codes. The industry composite figure is an equally weighted average of the ratio data for both the above reference codes. Composite ratios were calculated for as many years as historical ratio data could be obtained. Table 1 shows the industry medians used as benchmarks for comparison.

							Running Averages	
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1990-93**	**1990-94**
Solvency								
Quick Ratio	0.9	1.0	1.0	1.3	0.9	1.0	1.0	1.0
Current Ratio	2.1	2.2	1.9	2.6	2.1	2.1	2.2	2.2
Curr Liab / Equity	76.7%	74.4%	70.5%	54.7%	62.6%	59.7%	69.1%	67.8%
Curr Liab to Inventory	100.0%	96.3%	96.0%	87.9%	95.5%	115.3%	95.0%	95.1%
Total Liab to Stkhldr Equity	104.5%	124.4%	108.2%	100.1%	104.1%	96.0%	109.3%	108.2%
Fix Assets to Stkhldr Eq	46.6%	49.2%	39.9%	39.7%	40.7%	35.7%	43.8%	43.2%
Efficiency								
Collection Period	59.65	46.7	52.9	54.75	36.7	49.9	53.5	50.1
Sales / Inventory	5.7	5.1	5.3	5.25	5.2	5.3	5.3	5.3
Assets / Sales	62.8%	61.0%	64.0%	63.4%	64.6%	80.3%	62.8%	63.1%
Sales / Net work cap	5.1	4.4	4.3	3.9	4.8	4.8	4.4	4.5
Accts Payable/Sales	6.3%	5.5%	6.1%	6.0%	5.9%	7.5%	6.0%	6.0%
Profitability								
Profit Margin	4.5%	3.8%	3.2%	3.3%	3.4%	3.8%	3.7%	3.6%
Return on Assets (ROA)	6.2%	3.8%	4.9%	4.6%	4.9%	5.0%	4.9%	4.9%
Return on Equity (ROE)	11.5%	10.3%	11.9%	9.4%	12.9%	9.0%	10.8%	11.2%

Table 1. Industry Composite Medians for Financial Ratios

F. FINANCIAL PROSPECTS COMPARISONS

In principle, stock prices reflect a firm's future prospects. Purchase of a share of stock entitles the owner to the future dividends provided by the corporation and hence prices are set as a function of expectations concerning the future earnings and dividends. Thus, measures based on stock prices, in contrast to measures based on accounting data,

indicate investor expectations of future prospects of firms. Two stock price based measures were used in the analysis: Total return and P/E ratios.

1. Total Return

"Total return" was used as a measure to gauge a given company's stock performance. Total return is simply dividend yield plus price appreciation. For example, disregarding taxes, if a stock has a dividend yield of 5% and appreciates 10% in price over a one year period, then its total return for the same period is 15%. This total return can be used as a means of comparison against a market index, such as the Standard and Poor's 500, which tracks both the change in the level of the index, and separately, the average dividend yield of the index.

2. Price Earnings Ratio

Price earnings ratios (P/E's) are calculated daily on every stock that is traded on a major exchange. The P/E is computed by dividing its current (or closing) price by the company's annual earnings per share. The latter sum is usually taken to be the sum of the company's most recent four quarterly earnings reports, although some analysts use the earnings from the latest reported year (Teweles and Bradley, 1987). Historical price earnings ratios are also kept on all major indices and can be used to compare the P/E of a given stock against an index of which that stock is a part.

Price-earnings ratios reflect investors' expectations for the future earnings of a company. A higher P/E generally indicates increased future earnings expectations. Historically, the broad market has had a P/E from 10 to a high of 20. P/E's around 10 have been observed at market bottoms while P/E's of 20 or above have generally been seen at market peaks. Defense stocks have traditionally traded at relatively low price-earnings ratios, reflecting skepticism about whether earnings can be sustained (Cole, 1996).

For this analysis, P/E's were calculated using year end stock prices and earnings per share for the last given calendar year. P/E's were compared against S&P 500 historical data to determine if there has been a change over time in how investors were valuing the companies.

3. Use of S&P 500

The S&P 500 index, introduced in 1957, was designed by Standard & Poor's Corporation to provide a representative measure of stock market performance. The index includes common stocks of 500 companies that are traded in the U.S. stock markets, primarily on the New York Stock Exchange. These stocks represent 85 separate industries and make up approximately 68 percent of the market value of the U.S. stock markets. (NASA, 1997)

Standard and Poor's tracks statistics on the performance of the S&P 500 index and publishes these in their annual Security Price Index Record. Because of its breadth, the S&P 500, not the highly visible Dow Jones Industrial Average, is used as the benchmark against which all money managers compare the performance of their portfolios. In addition, it is one of the 12 Leading Economic Indicators. (Berlin, 1990)

The S&P 500 is a widely recognized, sufficiently broad market index. For this thesis, the S&P 500 was used as a basis against which the performance statistics--such as P/E and total return--of individual stocks was compared. Total return for the S&P 500 was determined by calculating the change in the level of the S&P 500 from year to year on a percentage basis, then adding in the year end dividend yield. Table 2 shows key statistics for the S&P 500 that were used in this study.

S&P 500 Data	1990	1991	1992	1993	1994	1995	1996	7yr avg
P/E Ratio	15.2	23.3	24.1	22.8	16.8	17.2	20.1	19.9
Total Return %	-2.82%	29.22%	7.33%	9.77%	1.35%	36.41%	22.68%	14.85%
Running Averages				1990-93	1990-94	1994-96	1995-96	
Average P/E				21.4	20.4	18.0	18.7	
Average Total Return %				10.9%	9.0%	20.1%	29.5%	

Table 2. Standard and Poor's 500 Index Historical P/E's and Total Return

G. READING THE TABLES

1. What Do the Numbers Mean?

Each company analysis uses measures provided in two tables that are shown in its respective chapter: the Company Raw Data Table and the Company Standardized Data

Table. The Raw Data Table contains just that—the actual individual financial amounts or ratios for a company.

In the company *Standardized* Data Table, the numbers shown are *relative to* industry average ratios. For example, if the company's quick ratio was 2.5, this would appear as the number "2.5" in the raw data table. In the standardized table, assuming the median quick ratio for that year was 1.25, the standardized number would be a "2." This means that the company's quick ratio of 2.5 for that year was two times the industry median of 1.25.

2. What Does the Shading Code Mean?

Three types of shading are used in the tables to highlight particular pieces of data: No shading, dark shading, and light shading, based on the value of individual ratios relative to the defense industry.

For the standardized total return and price earnings data; if the standardized measure falls within plus or minus 25% of the value of the average figure, then the number is considered within the "normal" range and its box has no shading. If a particular figure falls more than 25% below the industry adjusted benchmark, then it is shown with dark shading. If the figure is more than 25% above, then it is shown with light shading.

A similar procedure applies for the ratio measures, using upper and lower quartiles as published by Dun and Bradstreet. As before, if the number is between the upper and lower quartiles, it is considered within the "normal" range and is in a box with no shading. If a particular ratio falls in the *lower* quartile for the industry adjusted benchmark, then it is shown with a dark shading. If the ratio is falls with the *upper* quartile, then it is shown with a light shading.

This standardized table, marked with dark shading for lower quartile figures and light shading for upper quartile figures, enables the eye to scan quickly for measures that fall out of the middle range of data.

H. WRITTEN ANALYSIS

A final written analysis incorporates the macro level issues that cannot be seen solely through the financial ratio data and stock performance data. Industry position, synergies, and longer term outlook are tied in with the effects of mergers and acquisitions on the companies under study.

I. ASSUMPTIONS

Three assumptions were made prior to this analysis:

1. Absence of Synergy

The absence of synergy assumption recognizes that there are two reasons for a change in the performance of combined companies: Industry effects and firm-specific effects. Firm specific effects can be related to the merger, or may have been the result of events that had nothing to do with the company's recent restructuring. Industry effects are moderated by using financial ratio data that is compiled from the defense industry.

When two companies consolidate operations, one of the reasons often stated is to achieve critical synergies. To investigate this effect in this thesis, an assumption was made that if Company A has twice the total assets of Company B, then purchases company B, it can be expected that the contribution Company A makes to the new financial data will be twice that of Company B. In the absence of synergy, the ratios for the combined firm would look like a weighted average of their parts. If synergy is achieved as a result of the merger, then some positive results could be expected to be seen. Such a result would then be reflected in a divergence of a ratio value for the mergered company from the weighted average of the two merging companies.

2. Random Walk

The random walk assumption is based on the theory that, in a time series, the expected value in the next period is equal to the most recent value (Dyckman, 1986). Since this thesis compares financial data over time, observing changes, one assumption is that the data would follow a random walk, remaining unchanged in the absence of some event causing a change. Observed changes are thus attributed to events (i.e. mergers) that have occurred.

3. Purchase Accounting Bias

Under purchase accounting for a merger, a new basis of accounting is adopted. The old book values of assets and liabilities of the purchased company are ignored; those assets and liabilities are recorded at their market values at the date of acquisition on the consolidated balance sheet, with any excess of the purchase price categorized as goodwill. In subsequent periods, the consolidated income statements show depreciation and amortization expenses based on these market values. This is in contrast to pooling accounting, where a merger is the uniting of ownership interests in two separate companies via an exchange of stock. Because neither the of nature of ownership or the nature of operations changes, no new basis of accountability arises. The book values of the assets and liabilities of the predecessor companies carry over to the newly merged firm. (Stickney, 1994)

The alternative accounting treatments have some implications for the ratio values expected for the merged firm. Since no new basis of accounting occurs under pooling accounting, no change in financial statement measures and financial should result merely as a consequence of accounting. But, under purchase accounting, since the assets and debt of the acquired company are set to a new basis on the books of the buyer at market value, some impact on financial ratios could occur. The market value of net assets of the new company is usually greater than the old book values of net assets for the two separate firms. This can have an effect on the comparison of financial ratios, which is important when compared against the weighted average pro forma calculations. Return ratios would tend to be lower because stockholders' equity and assets have increased, while solvency measures would tend to look better because debt is smaller relative to assets and equity, which are now larger.

Thus, the pro forma ratio data on the raw and standardized tables is used as an implicit hypothesis of what the ratios "should be" if the these assumptions—the random walk and absence of synergy--are made, but with an awareness of the effects of the purchase accounting bias.

IV. NORTHROP ACQUIRES GRUMMAN

A. COMPANY OVERVIEW

1. General Background

Northrop Grumman Corporation, headquartered in Los Angeles, California, is a leading designer, systems integrator and manufacturer of military surveillance and combat aircraft, defense electronics and systems, airspace management systems, information systems, marine systems, precision weapons, space systems, and commercial and military aerostructures. With 1996 revenues of $8.1 billion, Northrop Grumman is the smallest of the five largest U.S. defense contractors. The company employs nearly 47,000 people.

2. How does Northrop Grumman Generate Revenue?

The company is best known for making the B-2 Stealth bomber, EA-6B and E-2C Hawkeyes. Northrop Grumman makes components for the F/A-18 and F-14 fighters and parts for commercial customers who include Boeing, Airbus, and Gulfstream. Electronic systems for military and commercial use comprise about 1/2 the company's sales. These include radars for a variety of aircraft, sensors and radar-jamming equipment, missile systems, subsystems to Lockheed Martin on programs like F-16, F-22, and AH-64 "Apache Longbow," and computer systems for both government and commercial use.

3. Recent Merger/Acquisition History

Effective 18 May 1994, Northrop Grumman Corporation was formed as a result of Northrop Corporation's $2.1 billion purchase of Grumman's outstanding common stock at $62/share. This purchase, financed mainly with new borrowings, is the focus of this chapter.

Also in 1994, the company completed the acquisition of Vought Aircraft, a major producer of military and commercial aerostructures, for $130 million in cash. Previously, the company had purchased a 49% interest in Vought for $45 million in September 1992. Both acquisitions were recorded using the purchase method of accounting.

In 1996, Northrop Grumman acquired the defense and electronics systems business of Westinghouse Electric Corporation for $3 billion. Acquisition of the

Westinghouse Electronics Systems business in 1996 has transformed Northrop Grumman into a defense electronics firm. Approximately 53% of sales now come from high-tech/high-growth defense electronics and data systems.

B. SOLVENCY

1. Observations

(Northrop, Grumman, and Northrop Grumman's raw and standardized financial data are shown in Tables Three and Four, respectively.)

Northrop's financial data from 1990-1993 indicate that the company was consistently less than the industry composite medians in the area of solvency. On average, Northrop's current and quick ratios were 0.8 and 0.7 of the industry medians. Particularly noteworthy was the high percentage of current liabilities to inventory for the years 1990-1993; all of these measures fell into the lowest quartile of the industry.

Financial ratios for Grumman from 1990-1993 show healthy solvency numbers. Grumman's current and quick ratios were 1.5 and 1.4 times the industry average for the period. The liability ratios are all greater in value than industry medians, but not so high that they fall into the worst quartile.

In 1994, the year Northrop acquired Grumman, solvency was abysmal, in the worst quartiles of the industry for five out of six of the solvency measures. Additionally, from looking at the raw data on Table Three, all solvency measure for this year of the merger were worse than the weighted pro forma averages that are calculated.

2. Interpretations

Liquidity worsened significantly at the time of the merger, with five of six solvency ratios in the worst quartile for the industry.

3. Conclusions

Northrop financed the purchase of Grumman with new borrowings. The debt as a result of the merger had an immediate impact on financial condition, putting the company in the worst quartile for the industry for most solvency measures in 1994. By 1995, the company was still in the lowest quartiles for four of six ratios, but had improved its performance in four of them; this reflected the corporation's efforts at consolidating

Northrop Grumman

S.I.C. 3721 Others: 3812, 3761, 3769, 3674, 7373, 7379, NOC

1994: Northrop completes $2.17 billion ecquisition of Grumman Corp. at $62/share. (Purchase method, financed with meinly new borrowings)

1994: NOC acquires remaining 51% of Vought aircraft for $130 million. (Purchase method: Paid in cash)

1996: NOC buys Westinghouse's defense businesses for $2.9 billion.(financed with new borrowings.)

	NORTHROP:					GRUMMAN:					NORTHROP GRUMMAN:		
	1990	1991	1992	1993		1990	1991	1992	1993		*1994	1995	1996
Cash & equivelents	173	203	230	100		75	172	299	348		17	16	44
Accounts Receivable	844	860	791	620		679	614	534	519		1,202	1,197	1,356
Inventory	721	693	670	569		950	760	612	499		1,043	771	1,053
Fixed assets	1,239	1,177	1,124	1,016		708	434	399	373		1,376	1,176	1,402
Current Assets	1,765	1,807	1,760	1,560		1746	1626	1487	1423		2,431	2,072	2,597
Total Assets	3,094	3,126	3,162	2,939		2454	2363	2089	2024		6,047	5,455	9,422
Current Liabilities	1,214	1,196	1,406	1,079		558	454	611	518		1,964	1,715	2,600
Accounts Peyable	330	407	363	324		223	150	129	146		396	360	452
Total Liabilities	2,061	1,948	1,908	1,617		1587	1256	1296	1186		4,757	3,996	7,294
Net Sales	5,490	5,694	5,550	5,063		3990	3963	3492	3225		6,711	6,616	6,071
Net Income	210	268	121	96		66	99	-123	59		35	252	234
Net Working Capital	571	611	354	461		1,188	1,172	676	905		467	357	-3
Stockholders Equity	1033	1182	1254	1322		668	952	793	636		1,290	1,459	2,126
STOCK DATA					Avg.					Avg.			
Yeer end stock price	19	25	30	37.375		16	17	24	40.125		42.68	62	80
Dividend	1.20	1.20	1.20	1.60		1.00	1.00	1.00	1.15		1.60	1.60	1.60
Dividend yield %	8.3%	4.8%	4.0%	4.3%	4.8%	5.6%	5.9%	4.2%	2.9%	4.6%	3.7%	2.6%	2.0%
EPS	4.48	4.26	2.56	1.99		2.46	2.84	-3.49	1.67		0.72	5.16	6.41
Price earnings ratio	4.2	5.9	11.7	16.6	10.2	7.3	6.0	-8.9	24.0	7.6	59.5	12.0	12.5
Total return for year	14.69%	36.38%	24.00%	28.66%	26.0%	22.63%	0.33%	45.34%	70.05%	34.6%	18.45%	47.19%	31.03%
RATIOS	1990	1991	1992	1993		1990	1991	1992	1993		1993	*1994	1995	1996
Solvency					Avg.					Avg.	wt avg			
Quick Ratio	0.8	0.9	0.7	0.9	0.8	1.4	1.7	1.4	1.7	1.5	1.2	0.8	0.7	0.5
Current Ratio	1.5	1.5	1.3	1.4	1.4	3.1	3.6	2.4	2.7	3.0	2.0	1.2	1.2	1.0
Curr Liab to Stkhldr Equity	117.5%	101.2%	112.1%	61.6%	103.1%	64.3%	47.7%	77.0%	62.0%	62.7%	73.6%	152.2%	117.5%	122.2%
Curr Liab to Inventory	168.4%	172.6%	209.9%	189.8%	165.1%	56.7%	59.7%	99.8%	103.8%	60.5%	154.6%	188.3%	222.4%	246.9%
Tot Liab to Stkhldr Equity	199.5%	164.6%	152.2%	122.3%	159.7%	182.8%	132.1%	163.4%	142.1%	155.1%	130.4%	368.8%	273.9%	342.8%
Fixed Assets to Stkhldr Eq	119.9%	99.6%	89.6%	76.9%	96.5%	61.6%	45.6%	50.3%	44.6%	55.5%	63.7%	106.8%	60.6%	65.9%
Efficiency														
Collection Period	56.1	55.1	52.0	59.1	55.6	62.1	56.6	55.6	56.7	56.3	59.0	65.4	64.1	61.3
Sales / Inventory	7.6	8.2	8.3	8.9	8.3	4.2	5.2	5.7	6.5	5.4	7.9	6.4	6.6	7.7
Assets / Sales	58.4%	54.9%	57.0%	58.0%	56.6%	61.5%	59.6%	59.6%	62.6%	60.9%	60.0%	90.1%	80.0%	116.7%
Sales / Net work cap	9.6	9.3	15.7	10.5	11.3	3.4	3.4	4.0	3.6	3.6	7.7	14.4	19.1	-2690.3
Accts Peyable/Sales	6.0%	7.1%	6.5%	6.4%	6.5%	5.6%	3.8%	3.7%	4.6%	4.4%	5.7%	5.9%	5.3%	5.6%
Profitability														
Profit Margin	3.8%	4.7%	2.2%	1.9%	3.2%	2.2%	2.5%	-3.5%	1.8%	0.7%	1.9%	0.5%	3.7%	2.9%
Return on Assets (ROA)	6.8%	8.6%	3.8%	3.3%	5.8%	3.5%	4.2%	-5.9%	2.9%	1.2%	3.1%	0.8%	4.8%	2.5%
Return on Equity (ROE)	20.3%	22.7%	9.8%	7.3%	15.0%	9.9%	10.4%	-15.5%	7.1%	3.0%	7.2%	2.7%	17.3%	11.0%

Table 3. Northrop Grumman Raw Data Table.

| Northrop Grumman | | |

operations in an attempt to reduce debt from the recent acquisitions.

C. EFFICIENCY

1. Observations

Northrop generally was as efficient as industry medians from 1990-1993, except for sales to net working capital.

From 1990-1993, Grumman's efficiency ratios, with the exception of sales to net working capital in 1990, are all within the normal range of 25% of industry composite medians.

For the new Northrop Grumman, standardized efficiency measures all fall within normal ranges, except for sales to net working capital in 1994 and 1995. The sales to working capital ratio is highlighted on the Table Four as being in the best quartile of the industry.

2. Interpretations

Efficiency was in the normal for both companies prior to the merger and for the combined company afterward, but four of five ratios after Grumman's acquisition in 1994 are less than the pro forma weighted average.

3. Conclusions

The company's efficiency was negatively affected at the time Grumman was acquired. The only measure that was better than the pro forma weighted average was sales to net working capital, which at face value seems good. But as a result of the acquisition of Grumman, the new company inherited Northrop's struggle to maintain working capital. Table Three shows that the sales to working capital ratio increased primarily *as a result of the decline in working capital*, making it appear to be in the best quartile in the industry. Working capital in 1994 is about only 1/3 the total of both predecessor companies' working capital in 1993, while sales were 80% of 1993 totals. The company was stretched for short term capital, which declined further in 1995 to $357 million. In 1996, it was actually negative.

D. PROFITABILITY

1. Observations

On average, Northrop was within the normal range for the three measures of profitability for 1990-1993.

Except for a loss in 1992, Grumman was also within the normal range of the industry.

All profitability measures declined to the lowest quartile of industry figures for 1994, the year of the acquisition of Grumman.

2. Interpretations

In the short run, profitability was impacted negatively by Northrop acquiring Grumman, which is consistent with the assumption made in Chapter III regarding the purchase accounting's tendency to show worse profitability.

3. Conclusions

The cost of consolidating operations was the major cause of the reduced profitability at this time. An early retirement charge of $282 million in 1994 offset operating margin, as did the addition of Grumman and Vought retiree plans. Northrop Grumman also took a $42 million pretax charge for the planned disposal of excess real estate and other assets.

E. TOTAL RETURN

1. Observations

On a total return basis, the stocks of both Northrop and Grumman surged further ahead than the S&P 500 in every year from 1990-1993, except in the case of Grumman in 1991. Significant point: For 1994, the total return of Northrop Grumman was 13.6 times the return of the broad market. In 1995 and 1996, the combined company saw gains of 47% and 31%, respectively, significantly outpacing the S&P 500's performance which was 36% in 1995 and 23% in 1996.

2. Interpretations

Grumman investors were rewarded by the merger by a price gain of 55% from the end of 1993; Northrop stockholders saw a gain of 15% in the year of the acquisition of

Grumman. Both of these gains were substantially higher than the total return of 1.35% for the broad market in 1994.

3. Conclusions

The stock market reacted favorably to the acquisition of Grumman by Northrop, as seen in the index shattering performance of Northrop Grumman's stock. Both Northrop and Grumman shareholders were rewarded with total returns well in excess of the S&P 500 index in the year of the merger, and for each year after. *(See Figure 2.)*

F. PRICE/EARNINGS RATIO

1. Observations

P/E ratios of both companies were, on average, only a fraction of the overall market in the years 1990-1993. On average, Northrop and Grumman had P/E's of 50% and 40% respectively of the overall market. In December 1996, it stood at 60% of the average P/E of the S&P 500. (Note that in 1994, the P/E of Northrop Grumman was 3.5 times the P/E of the overall market. This was due to low net income for the year, yet still reflects investors expectations about the long term prospects for the company.) For 1994-1996, the P/E was on average 1.6 times the P/E of the overall market, with 1994's value of 3.5 driving the average higher than one.

2. Interpretations

From the time of the merger forward, the P/E ratio has still been less than the P/E of the broad market, but has generally increased relative to averages for the years 1990-1993.

3. Conclusions

The increase in P/E ratios relative to the market shows that investors expectations of financial prospects for Northrop Grumman increased considerably at the time of formation of the new company in 1994. Investors were beginning to hold higher expectations for the company.

G. MACRO LEVEL ISSUES

Northrop Grumman shows the signs of strain that might be expected for a company that has engaged in two major, aggressive, acquisitions within two years.

Northrop Grumman had some challenges servicing the debt used to close this deal.

ROE shows marked gains, due to the fact that the acquisitions were financed with new borrowings and did not result in the issuance of new stock.

Northrop Grumman's purchase of Westinghouse's defense businesses in 1996 for $2.9 billion can be seen in the solvency ratios of 1996. (One significant note: Net working capital is actually negative at year end.) Where current liabilities to equity and total liabilities to equity had improved in 1995, they shot up in 1996, due in part to Northrop Grumman's interest expense in 1996 of $133 million.

Directly impacting 1996 is the purchase of Westinghouse's defense businesses for $2.9 billion. While industry composite ratios cannot be calculated for this year, all but one of the measures is worse for 1996. Most noteworthy is the increase in total liabilities to stockholders equity from 273.9% (already in the worst quartile) in 1995 to 342.8% in 1996.

H. ANALYSIS

Northrop and Grumman shared many complementary businesses—military airframe design and construction, electronic systems, commercial and military aerostructures, and to a lesser extent, information systems. From a strategic standpoint, Northrop's acquisition of Grumman appears to have been a wise choice to achieve future economies of scale. If Northrop thought it could achieve synergies by combining with Grumman, then Grumman's capable financial figures probably made it seem an attractive acquisition. While coping with the debt load from recent acquisitions, Northrop Grumman's long term business position has been enhanced with this successful acquisition.

Figure 2. Northrop Grumman Stock vs. The Standard and Poor's 500 Index. (After Microsoft Network Charts)

V. LOCKHEED MERGES WITH MARTIN MARIETTA

A. COMPANY OVERVIEW

1. General Background

Lockheed Martin Corporation, headquartered in Bethesda, MD, develops, designs, manufactures and integrates advanced technology products and services. Its core businesses are organized into five major operating sectors: Space & Strategic Missiles, Aeronautics, Information & Technology Services, Electronics, and Energy & Environment.

Lockheed Martin had 1996 revenues of $26.8 billion. The company's $12 billion in prime military contract awards the same year account for about a quarter of the Pentagon's annual $50 billion procurement budget. Lockheed Martin is the largest defense contractor in the U.S. and employs nearly 170,000 people.

2. How Does Lockheed Martin Generate Revenue?

Lockheed Martin is engaged primarily in the research, design, and production of military aircraft, space systems, missiles and electronic systems. Lockheed makes the F-16 fighter, C-130 transport and P-3 antisubmarine aircraft, and is working with Boeing in developing the F-22 advanced tactical fighter. Lockheed Martin is the prime contractor for the Navy's fleet ballistic missile system and holds contracts for NASA and DoD space projects. Lockheed Martin's government products include the Trident II submarine-launched ballistic missile, external fuel tanks for the space shuttle, and the Titan IV space launch vehicle; commercial products include spacecraft for Motorola's satellite communication network.

3. Recent Merger/Acquisition History:

The company is the product of a 1995 merger between Lockheed and Martin Marietta, which is the focus of this chapter. The merger was a pooling of interests, executed via an exchange of $10 billion in common stock on March 15, 1995; Lockheed shareholders received 1.63 of the Lockheed Martin stock for each share of Lockheed,

while Martin Marietta stockholders received new Lockheed Martin stock on a 1:1 basis for each share held.

Prior to the merger, Lockheed had purchased General Dynamics fighter businesses for $1.5 billion in 1993. Martin Marietta acquired General Electric's aerospace businesses for $3.05 billion in 1993 and followed up in 1994 with the purchase of General Dynamics' space division for $200 million. In 1996, Lockheed Martin acquired most of Loral for $9 billion, $7.1 billion in a cash offer of $38 per share and $2.1 billion in assumed debt.

B. SOLVENCY

1. Observations

(Lockheed, Martin Marietta, and Lockheed Martin's raw and standardized financial data are shown in Tables Five and Six, respectively).

For the years 1990-1994, Lockheed was in the in the lowest quartile of the composite industry averages in 14 of 30 ratios. By 1994, though, Lockheed was in the normal range, although at the edges, for all solvency measures except current liabilities to inventory, which was in the quartile of the worst companies.

Martin Marietta shows sporadic solvency patterns from 1990 forward. Most notably, the quick ratio and current liabilities to inventory are in the worst quartile as of 1994.

Looking at the Raw Data Table, Lockheed Martin's solvency measures in the year of the merger show marginal improvement when compared to the weighted average ratio calculations of 1993 data. Current liabilities to inventory, total liabilities to stockholders' equity, and fixed assets to stockholders equity are all less than 1993 weighted average calculations.

2. Interpretations

Solvency for Lockheed Martin was not materially affected by the merger.

3. Conclusions

Lockheed and Martin Marietta pulled off a merger that had little impact on the solvency position of the combined company, Lockheed Martin. This is due to the fact

that the merger was completed via a pooling of interests rather than an assumption of debt by either of the companies. Even with merger and consolidation charges of $436 million in 1995, long term debt was actually reduced by the company.

Lockheed Martin had not yet begun to fully integrate both of the former companies when it purchased Loral in 1996. The acquisition of Loral had an immediate effect on solvency, with solvency ratios degraded substantially from 1995-1996.

C. EFFICIENCY

1. Observations

Efficiency ratios do not indicate any continuing patterns prior to the merger of Lockheed and Martin Marietta. One note: Martin Marietta was on average 3.3 times the industry norm for sales to inventory and 2.5 times sales to net working capital.

Lockheed Martin's assets to sales ratio stayed constant after the merger, and actually declined relative to the industry median.

After the merger and the Loral purchase in 1996 one efficiency ratio that was affected negatively is the 127% assets/sales, which is the only time after 1989 that this has been over 100%.

2. Interpretations

In three of five measures--collection period, assets to sales, and accounts payable to sales--the 1995 results are better than pro forma calculations would suggest.

3. Conclusions

The merger between Lockheed and Martin had mixed impact on efficiency. Several measures were better and the lower assets to sales ratio, relative to past averages, suggests that the company's plans for consolidating some operations were working.

| Lockheed Martin | | |

Lockheed Martin

S.I.C. 3812 Others: 3761, 3721, 3663, 3489, 3572, 8733

Lockheed: 1993-bought GD mil aircraft bus for $1.5 billion in cash plus assumption of certain liabilities. (purchase method of accounting)

Martin Marietta: 1993-bought GE aerospace for $3.05 billion, 1994-bought GD space division for $160 million (both purchase method of accounting)

1995: Lockheed and Martin Merietta merge, using pooling of interests method of accounting. 1 LK=1.63 LMT, 1 ML=1 LMT

1996: LMT acquires most of Loral for $9 billion. $7bill to Loral shareholders in tender offer of $38 share. $2.1 in assumed debt.

INDUSTRY DEFLATED FIGURES	LOCKHEED:						MARTIN MARIETTA:						LOCKHEED MARTIN:	
	1990	1991	1992	1993	1994	Avg.	1990	1991	1992	1993	1994	Avg.	'1995	1996
Price earnings ratio	0.4	0.3	0.4	0.5	0.6	0.5	0.5	0.4	0.4	0.5	0.5	0.5	1.5	0.8
Total return for year	-3.8	1.2	4.6	2.6	6.7	2.4	4.3	0.9	1.7	3.8	3.2	2.8	2.1	0.8
RATIOS	1990	1991	1992	1993	1994		1990	1991	1992	1993	1994		1994 Wtd. avg	'1995
Solvency						Avg.						Avg.		
Quick Ratio	1.0	0.7	0.8	0.8	0.9	0.8	1.0	1.1	1.9	0.8	1.2	1.2	1.1	0.9
Current Ratio	0.6	0.8	0.7	0.8	0.7	0.6	0.7	0.8	1.3	0.9	0.7	0.8	0.7	0.8
Curr Liab to Stkhldr Equity	1.5	1.5	1.8	1.9	1.6	1.6	0.8	0.7	0.4	1.2	0.9	0.8	1.2	1.4
Curr Liab to Inventory	2.2	2.1	2.3	1.7	1.8	2.0	2.2	1.8	1.1	3.7	3.1	3.0	2.4	1.8
Tot Liab to Stkhldr Equity	1.8	1.3	2.1	2.1	2.2	2.0	1.3	0.9	0.8	1.2	1.5	1.2	1.8	1.8
Fixed Assets to Stkhldr Eq	1.2	1.5	2.3	2.0	1.6	1.8	1.8	1.5	1.8	1.5	1.2	1.5	1.4	1.4
Efficiency														
Collection Period	1.2	1.3	1.1	0.8	1.3	1.1	0.8	1.1	0.9	1.0	1.5	1.1	1.4	1.2
Sales / Inventory	1.5	1.4	1.6	1.5	1.5	1.5	2.3	2.2	3.7	5.0	3.1	3.3	2.3	1.5
Assets / Sales	1.1	1.1	1.0	1.1	1.1	1.1	0.9	1.1	0.9	1.3	1.3	1.1	1.2	1.0
Sales / Net work cap	2.1	3.8	3.7	2.6	1.8	2.8	3.0	2.1	1.7	3.8	2.2	2.5	2.0	1.6
Accts Payable/Sales	1.2	1.2	1.2	1.1	1.1	1.2	1.1	1.4	0.7	0.9	1.0	1.0	1.1	1.0
Profitability														
Profit Margin	0.7	0.8	-0.9	1.0	1.0	0.5	1.2	1.4	1.8	0.1	1.9	1.2	1.4	0.8
Return on Assets (ROA)	0.8	1.2	-0.8	1.0	1.0	0.8	1.5	2.1	1.1	0.1	1.5	1.4	1.2	0.8
Return on Equity (ROE)	1.3	1.2	1.2	1.8	1.2	0.9	1.8	1.7	1.5	0.1	1.5	1.7	1.3	1.2

Table 6. Lockheed Martin Standardized Data Table.

D. PROFITABILITY

1. Observations

Lockheed profitability figures show a solid company, with figures at--or higher than--industry medians for 1993 and 1994.

With the exception of 1993, Martin Marietta was clearly a profitable company for the years 1990-1994. In 1994, the company's profitability ratios were near the upper quartile (all three measures were at least 1.5 times industry average) of the industry figures.

Profitability ratios all dipped in 1995 from what both companies had shown in the year before the merger, but were all within industry norms.

2. Interpretations

All profitability measures but one were less than each individual company's performance in 1994, and all were less than the weighted average pro forma measures predicted.

In 1995, the year of the merger, profitability figures dropped in both real and standardized terms, but were still well within the bounds of industry norms.

3. Conclusions

The overall profitability picture for Lockheed Martin shows that although the firm was profitable within industry norms, its profitable measures were affected negatively at the time of the merger in 1995. This was primarily a result of Lockheed Martin's consolidation plan, which included after tax charges of $436 million, a 39% reduction of that year's net income.

E. TOTAL RETURN

1. Observations

Lockheed's stock outperformed the S&P 500 in total return by significant margins in the years immediately preceding the merger. From 1990-1994, Lockheed's total return averaged 18.6% annually, more than double the performance of the broader market. For those same years, Martin Marietta's stock experienced an average total return of 18.3% annually, versus 9% for the S&P 500.

Martin Marietta shareholders saw a 75% gain in 1995 in the conversion of the stock to Lockheed Martin, more than doubling the 36% return of the index that year. Lockheed shareholders saw a similar gain of 76% after calculations for the conversion of one share of Lockheed to 1.63 shares of Lockheed Martin.

In 1996, though, total return was only 80% of the broad market.

2. Interpretations

Total return as a result of the merger was better than the overall market *(See Figure 3)* for 1995, but dropped to less than the market for 1996.

3. Conclusions

The stock market reacted favorably to the merger of Lockheed and Martin Marietta, as seen in the performance of Lockheed Martin's stock at the time. However, given average returns of 2.4 and 2.8 times S&P 500 for 1990-1994 for the predecessor companies, this was a decline relative to average performance. The stock market euphoria that drove returns sky high in 1995 was moderated in 1996; Lockheed Martin returned only 80% of the broad market, partly a result of investors reacting to the $2.1 billion in assumed debt from the acquisition of Loral and also possibly due to a natural readjustment from years of outpacing the market.

F. PRICE/EARNINGS RATIO

1. Observations

Price earnings ratios for both Lockheed and Martin Marietta were generally no more than 50% of the average P/E ratio for the broader market prior to the merger. Investors bid the P/E ratio up in 1995, when the year closed with Lockheed Martin's P/E ratio at a 50% premium to the S&P 500 P/E. This declined in 1996 to 0.8, but these are still the highest numbers that had been seen since 1990 by either of the former companies.

2. Interpretations

Investors' expectations of financial prospects for Lockheed Martin increased considerably at the time of formation of the new company in 1995; the P/E ratio for Lockheed Martin increased beyond the average market P/E, when it had never done so in five years prior. In 1996, P/E dropped to less than the market.

3. Conclusions

The climb in P/E ratios was a result of investors driving the stock price higher with increased expectations. The change in performance in price earnings ratios is consistent with the change in total return that went above market in 1995 and below market in 1996. This is the same reaction of the market that was reflected in total return.

G. MACRO-LEVEL ISSUES

Lockheed Martin took $690 million in pretax charges for merger related expense in 1995. Earnings before interest and taxes had dropped in 1995 and the company needed to realize some of the economies of scale for which it had merged. On 26 June 1995, the corporation announced a corporate-wide consolidation plan, which was expected to yield annual savings of approximately $1.8 billion. Under the plan, the company will close 12 facilities and laboratories, 26 redundant field offices, and eliminate approximately 12,000 positions and 7.7 million square feet of unneeded capacity over the next 5 years. The cost to implement the plan is approximately $1.7 billion.

H. ANALYSIS

Long term positioning is the goal of Lockheed Martin. The merger provided a line of small rockets, which complemented the satellite business and as a result positions the company for future growth in space systems.

According to its 1996 annual report, Lockheed Martin has adopted a three-pronged strategy:

1. Build market share in core businesses.
2. Move into adjacent markets via related businesses.
3. Divest non-core businesses.

These three points are critical if Lockheed Martin expects to fully realize the benefits of its 1995 merger and subsequent acquisition of Loral in 1996. The effect on the balance sheet is present, but all the ratios except one are still within or above industry norms and profitability is strong for the company. Like Northrop Grumman, Lockheed Martin has aggressively positioned itself to exploit profitable entities that will add to its long term bottom line, but Lockheed Martin's use of pooling accounting rather than

assuming debt kept the company more solvent in the process.

Figure 3. Lockheed Martin Stock vs. The Standard and Poor's 500 Index

VI. RAYTHEON PURCHASES E-SYSTEMS

A. COMPANY OVERVIEW

1. General Background

Raytheon Company, headquartered in Lexington, MA, is an international high technology company. The corporation is a worldwide developer and producer of electronics systems and products in the areas of intelligence, reconnaissance and surveillance systems, command and control, specialized aircraft maintenance and modifications, guidance, navigation and control, communications and data systems. In 1996 sales were $12.3 billion and the company had $3 billion in prime contract awards.

2. How does Raytheon Generate Revenue?

Raytheon operates in four business areas: commercial and defense electronics, aircraft, engineering and construction (focusing on industrial projects), and major appliances (including Amana, Caloric, and Speed Queen). Products include semiconductors, air traffic control systems, Patriot missile systems, marine electronics, Hawk, Sidewinder, Sparrow, Stinger, and AMRAAM. The company also makes fire control systems, radars, communication equipment, and microwave components. The company is the top US manufacturer of small passenger aircraft, under the names Beech, King Air, and Baron.

3. Recent Merger/Acquisition History

Raytheon acquired E-Systems, an industry leader in intelligence, reconnaissance, and surveillance systems, for $2.3 billion effective May 8, 1995; stockholders at E-Systems were paid $64 for each share owned. E-Systems's technology base was closely aligned with Raytheon and it now operates as a wholly owned subsidiary.

In 1996, Raytheon acquired the modification and defense electronics businesses of Chrysler Technologies for $455 million.

Raytheon made two aggressive moves in 1997, announcing plans to purchase the defense electronics business of Texas Instruments for $2.95 billion in cash, and to acquire

GM's Hughes Aircraft for $9.5 billion, $5.1 billion in common stock and $4.4 billion in debt.

B. SOLVENCY

1. Observations

(Data for Raytheon, E-Systems, and Raytheon w/E-Systems as a subsidiary are shown as raw and standardized numbers in Tables 7 and 8 respectively.)

For the years 1990-1994, 13 out of 30 solvency measurements for Raytheon are in the worst quartile of the industry averages. Raytheon quick and current ratios were on average only 0.3 and 0.4 of the industry composite ratios.

Prior to the merger, E-Systems had shown remarkable solvency since 1990. Of 30 solvency measurements taken over the time period, E-Systems was above industry medians in 27 of them, and in 12 cases was in the upper quartile. Current and quick ratios are on average 2.0 and 1.7 times the composite figures. The other four solvency measures are also all better than industry medians for these years. Interesting note: In 1994, the year before E-Systems was bought by Raytheon, four of six solvency measures are in the best quartiles for the industry.

Solvency for Raytheon after the purchase of E-Systems in 1995 worsened in all measures. Three of six solvency measures for 1995 are in the worst quartiles of the industry. Particularly noteworthy, although it still falls within the normal range in 1995: Total liabilities to equity went from 0.8 of the industry average in 1994—within the normal range of values—to 1.3 times the industry median in 1995.

2. Interpretations

Raytheon's solvency declined as a result of the acquisition of E-Systems.

3. Conclusions

Raytheon paid for E-Systems in cash and the acquisition had an immediate negative impact on solvency. Considering the fact that three of its solvency ratios were in the worst quartiles of the industry in 1994, it is no surprise that this continued, and degraded somewhat in 1995.

Table 7. Raytheon Raw Data Table.

Raytheon / E-Systems:																			
S.I.C.: 3812																			
1995: Raytheon completes acquisition of E-Systems for $2.3 billion. $64/share cash offer ($125 million special + restructuring charges)																			
1996: Buys Chrysler Technologies Corp.'s defense businesses for $455 million.																			
1997: Plans to acquire def electronics business of Texas Instr for $2.95 billion. (in cash)																			
1997: Plans to acquire Hughes electronics defense bus for $9.5 billion ($5.1 bill in common stk & $4.4 bill in debt)																			
	RAYTHEON:							E-SYSTEMS:									RAYTHEON E-SYSTEMS:		
	1990	1991	1992	1993	1994			1990	1991	1992	1993	1994					*1995	1996	
Cash & equivalents	138	138	89	190	202			21.7	43.1	92.2	32.9	24.4					210	138	
Accounts Receiveble	782	740	660	728	979			43	409	432	438	429					927	809	
Inventory	1016	1015	1051	1500	1499			57	50	50	45	112					1,503	1,591	
Fixed assets	1532	1516	1420	1422	1361			269	272	307	308	319					1,584	1,802	
Current Assets	3603	3748	3776	4609	4986			597	867	748	750	780					5,275	5,604	
Total Assets	9119	6087	6015	7259	7396			967	1075	1254	1279	1374					9,841	11,126	
Current Liabilities	3146	2719	2137	2910	3293			182	190	248	169	196					3,690	4,692	
Accounts Peyable	996	919	900	915	995			75	79	96	70	95					1,042	1,126	
Total Liabilities	3273	2764	2172	2960	3497			350	325	594	509	537					5,549	9,529	
Net Sales	9268	9274	9058	9202	10013			1910	1991	2095	2097	2029					11,804	12,331	
Net Income	557	592	635	693	759			94	110	109	121	96					792	761	
Net Working Capital	457	1,032	1,639	1,699	1,703			385	477	499	591	584					1,585	912	
Stockholders Equity	2,847	3,323	3,843	4,299	3,928			926	750	960	770	837					4,292	4,598	
STOCK DATA						Avg.							Avg.			Note:			
Year end stock price	35	42	50	65	64			34.375	37.975	41.125	43	41.925				2 for 1	47.50	47.00	
Dividend	1.20	1.23	1.33	1.40	1.48			0.75	0.75	1.00	1.10	1.20				split in 95	0.75	0.80	
Dividend yield %	3.4%	2.9%	2.7%	2.2%	2.3%	2.7%		2.2%	2.0%	2.4%	2.6%	2.9%	2.4%				1.6%	1.7%	
EPS	4.27	4.48	4.72	5.11	4.51			2.74	3.35	3.31	3.59	2.79					3.25	3.21	
Price earnings ratio	9.2	9.4	10.9	12.7	14.2	11.0		12.5	11.3	12.4	12.0	14.9	12.6				14.9	14.9	
Total return for year	4.15%	22.92%	21.70%	32.15%	0.77%	16.3%		13.97%	12.16%	11.01%	7.12%	-0.31%	9.8%				54.60%	0.65%	
RATIOS	1990	1991	1992	1993	1994			1990	1991	1992	1993	1994			1994		*1995	1996	
Solvency						Avg.							Avg.		wtd avg				
Quick Ratio	0.29	0.32	0.35	0.32	0.36	0.3		0.36	2.38	1.99	2.78	2.30	2.0		0.66		0.31	0.20	
Current Ratio	1.15	1.38	1.77	1.58	1.52	1.5		3.12	3.51	3.01	4.44	3.98	3.9		1.90		1.43	1.19	
Curr Liab to Stkhldr Equity	110.5%	91.7%	55.6%	67.7%	83.6%	79.6%		29.1%	25.3%	37.9%	21.9%	23.4%	27.5%		74.2%		89.0%	102.0%	
Curr Liab to Inventory	309.6%	297.9%	203.3%	194.0%	219.0%	238.7%		67.7%	99.9%	80.9%	54.9%	92.0%	97.0%		194.4%		245.5%	294.9%	
Tot Lieb to Stkhldr Equity	115.0%	93.2%	59.5%	99.9%	88.3%	92.4%		55.9%	43.3%	90.0%	96.1%	84.2%	63.9%		84.5%		129.3%	142.0%	
Fixed Assets to Stkhldr Eq	53.9%	45.6%	37.0%	33.1%	34.6%	40.9%		43.0%	38.3%	48.5%	40.0%	37.9%	40.7%		35.1%		38.9%	39.2%	
Efficiency																			
Collection Period	30.6	29.1	29.6	29.9	35.6	30.2		6.7	75.0	75.3	79.2	79.7	92.4		42.0		29.7	23.9	
Sales / Inventory	9.1	9.1	9.9	6.1	6.7	7.9		6.7	7.3	6.9	9.9	9.4	6.9		6.6		7.9	7.9	
Assets / Sales	98.0%	65.9%	66.4%	79.9%	73.9%	70.2%		53.4%	54.0%	59.9%	61.0%	97.9%	59.2%		72.9%		63.4%	90.2%	
Sales / Net work cap	20.3	9.0	5.5	5.4	5.9	9.2		4.7	4.2	4.2	3.9	3.5	4.0		5.5		7.4	13.5	
Accts Peyable/Sales	10.7%	9.9%	9.9%	9.9%	9.9%	9.5%		4.1%	3.9%	4.9%	3.3%	4.7%	4.1%		9.3%		9.8%	9.1%	
Profitability																			
Profit Margin	9.0%	8.4%	7.0%	7.5%	7.6%	6.9%		5.2%	5.5%	5.2%	5.6%	4.7%	5.3%		7.1%		9.7%	6.2%	
Return on Assets (ROA)	9.1%	9.7%	10.9%	9.5%	10.3%	9.9%		9.7%	10.2%	9.7%	9.5%	7.0%	9.0%		9.7%		9.0%	9.9%	
Return on Equity (ROE)	19.6%	17.9%	19.5%	16.1%	19.3%	17.9%		15.0%	14.7%	19.5%	15.7%	11.5%	14.7%		19.1%		19.5%	16.6%	

| Raytheon w/E-Systems: | | |

C. EFFICIENCY

1. Observations

Raytheon's efficiency ratios were all better than or within industry norms for the 1993-1994 period.

E-Systems was within industry norms for the same period except for 1994, when the collection period was in the worst quartile of the industry.

Compared to Raytheon's ratios for 1994 (prior to the purchase of E-Systems), though, all 1995 ratios are better in relation to industry norms. For E-Systems, sales to inventory and sales to net working capital are better in 1995 compared to industry norms, while collection period in 1995 was in the best quartile of industry averages.

2. Interpretations

All efficiency ratios in 1995, when Raytheon acquired E-Systems show improvement relative to the pro forma values calculated for the year prior. Both companies were generally operating within the normal range of values for efficiency beforehand, and the newly integrated firm continued along the same path.

3. Conclusions

Efficiency improved relative to pro forma calculations from 1994.

D. PROFITABILITY

1. Observations

Raytheon's financial performance is highlighted by marked profitability for the time period 1990-1994. For the 15 profitability measurements taken during the period, Raytheon performed better than the industry in *all 15 of them,* as seen by the fact that all profitability figures in the standardized data table are above 1.0. For the years 1993 and 1994, Raytheon ranked in the industry upper quartile for profit margin and return on assets.

In 12 out of 15 instances, E-Systems was ahead of industry profitability medians as well; in two of those cases the company was in the upper quartile.

2. Interpretations

When compared to the pro forma weighted average calculated using 1994 data,

both profit margin and return on assets declined. Raytheon's profitability was still stronger than industry medians, though; after its E-Systems acquisition, the company turned in better than median numbers for 1995. Particularly noteworthy was the 2.1 times industry average ROE for that year.

3. Conclusions

Raytheon's profitability declined slightly by the acquisition of E-Systems. All three measures, though, were still over industry averages by at least 60%.

E. TOTAL RETURN

1. Observations

(Figure Four shows Raytheon's performance versus the S&P 500.)

E-Systems shareholders saw a 54% price gain in their stock in 1995 by the time it was purchased in April at $64/share by Raytheon. If they had immediately bought Raytheon stock at $38 with their money from the purchase, these same shareholders would have seen another 25% gain by the end of the year, for a total return of about over 80% for 1995.

When adjusted for a two-for-one stock split in 1995, Raytheon shareholders were treated to a 51% total return.

2. Interpretations

Considering the S&P 500 returned just under 37% for 1995, both sets of stockholders saw gains that outpaced the broader market by at least 50%.

3. Conclusions

Investors enthusiastically viewed the combination of Raytheon's and E-Systems. This was short lived. The market corrected for this exuberance by sending the S&P 500 up for a total return of 23% in 1996, while Raytheon's stock floundered at less than a 1% gain.

F. PRICE/EARNINGS RATIO

1. Observations

For the years 1990-1994, P/E ratios for Raytheon and E-Systems were 60% of the average P/E for the S&P 500. In 1995, the year E-Systems was acquired, the P/E for

Raytheon (w/E-Systems as a subsidiary) was 80% of the market.

2. Interpretations

Raytheon's P/E ratios demonstrate that the market valued the company more favorably over time via a higher P/E ratio.

3. Conclusions

Investors expectations of financial prospects for Raytheon had increased at the time of the acquisition of E-Systems in 1995. These were moderated in 1996, when the relative P/E decreased to from 0.8 to 0.7 of the overall market.

G. MACRO LEVEL ISSUES

The acquisition of E-Systems was a temporary challenge for the company, with virtually no consolidation occurring, outside of some administrative functions. Raytheon is concentrating efforts on obtaining synergies from its acquisitions. It has expanded the international sales of E-Systems from 4% to 17% mainly by exploiting Raytheon's already strong presence in the international market. Other plans include overhead cost savings in research and development, marketing, materials, and program operation. Additionally, work force reductions of 10% in the defense businesses over the next 2-1/2 years are expected as part of the plan to wring synergies from Raytheon's recent acquisitions.

After completion of the Texas Instruments and Hughes acquisitions, Raytheon will have a very competitive, diversified mix of businesses, manufacturing defense electronics systems and aircraft products, and providing energy and environmental services. The defense electronics segment has a well supported program base with good foreign demand, and will be bolstered substantially by the Texas Instruments and Hughes Electronics units.

H. ANALYSIS

With solid profitability and solvency, as well as efficiency ratios within the middle 50% of values for the industry, E-Systems was clearly a tempting target. Raytheon is yet another case of a company that is willing to mortgage its future in return for the promise of a larger presence in the defense marketplace. While Raytheon grapples

with the issues of reducing debt and gaining efficiencies in operations, they have continued to remain profitable.

The planned acquisitions of Texas Instruments and Hughes Electronics (for a total of $12.5 billion) will constrain financial flexibility for an extended period. Moody's Investors Services recently downgraded the long-term debt ratings of Raytheon, stating that they believe it will take several years for Raytheon to realize the full cost benefits of the acquisitions.

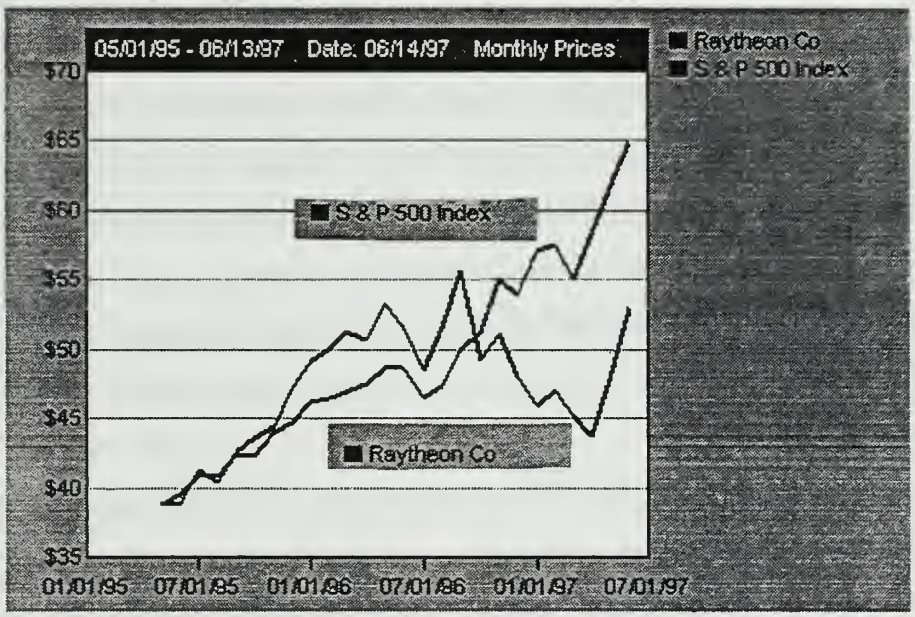

Figure 4. Raytheon Stock vs. The Standard and Poor's 500 Index

VII. CONCLUSION

A. SUMMARY

The purpose of this study was to determine the financial impact of selected major mergers in the defense industry since 1993 by analyzing both financial condition as reflected in accounting based financial ratios and financial prospects as reflected in market based measures. A summary of findings related to the research questions follows:

1. Financial Condition

a. Northrop Grumman

Northrop Grumman experienced a decline in solvency as a result of the acquisition of Grumman in 1994, which was financed with new borrowings. Efficiency was also negatively affected, with several ratios impacted by a lower working capital figure. Profitability declined to the lowest quartiles of the industry in all measures as Northrop took charges to fund early retirement plans and asset disposal.

b. Lockheed Martin

Lockheed Martin's solvency was not materially different after the merger in 1995, due to the fact that it merged via an exchange of common stock and not by an assumption of debt. Efficiency changes were mixed and reflected the company's efforts to implement a consolidation plan. Profitability was negatively affected by consolidation charges, although still within industry norms.

c. Raytheon

Solvency for Raytheon worsened in all measures as a result of the cash purchase of E-Systems, with three of the measures in the worst quartiles for the defense industry.

Raytheon's efficiency improved slightly; Profitability declined but was still greater than industry averages.

2. Financial Prospects

a. Northrop Grumman stockholders saw total returns in the year of the acquisition that were 13.6 times the S&P 500 performance of 1.35%. P/E increased to 3.5 times the market P/E in the year of the acquisition, decreasing later, but settling at

levels above where it had been in 1990-1993.

b. Lockheed Martin

Lockheed Martin stock rose an average of 75%, over twice the return of the S&P 500 that year. P/E increased over the market average before settling later at lower than the market, but higher than it had historically been.

c. Raytheon

Total return of over 51% for Raytheon was significantly higher than the return on the S&P 500 of 36%. Raytheon's P/E ratio went up during the year it acquired E-Systems, then moderated to a level that was higher than it had been in the four years prior.

B. CONCLUSIONS

Financial condition of the two firms that made purchase type acquisitions—Northrop Grumman and Raytheon--was marked by a degradation in solvency as a result of the merger or acquisition; this is despite the purchase accounting bias discussed in Chapter III. Both these companies' solvency ratios were the lowest than at any time since before 1990. Lockheed Martin, which merged via a pooling of interests, saw no material impact on its solvency ratios.

Impacts on efficiency ratios were mixed; Northrop Grumman's ratios were affected negatively, while Lockheed Martin had mixed effects and Raytheon's ratios improved. All companies' ratios generally remained within industry norms at the time of the merger event.

Profitability ratios generally declined as a result of the mergers, but always stayed positive and showed improvement in later years despite subsequent additional acquisitions. The effect of the bias of purchase accounting was not significant. For example, two of Raytheon's profitability ratios declined relative to pro forma calculations in the year of its acquisition of E-Systems, and all of them declined again in 1996. Northrop Grumman saw similar results, but Lockheed Martin—which used pooling accounting--also experienced declines relative to pro forma calculations.

The stocks of the companies involved in the mergers and acquisitions outperformed the Standard and Poor's 500 index for most of the years leading up to the merger, and particularly for the year of the merger itself. In the merger years, the lowest total return was posted by Raytheon—1.5 times the total return of the S&P 500 for 1995, behind Lockheed Martin's performance of 2.1 times the S&P 500 in 1995, and far behind Northrop Grumman's 13.6 times the S&P 500 return in 1994. Gains seen during the years of these mergers were not repeated in subsequent years. Loughran and Vijh's study, which noted that companies that made purchase type acquisitions experienced greater returns than their peers and the overall market, could not be confirmed or refuted by this analysis; Northrop Grumman, which was a purchase type acquisition, saw its stock increase the most in relation to the S&P 500 in the year of the merger, followed by Lockheed Martin which used a pooling of interests, and trailed by Raytheon, another purchase acquisition whose relative outperformance was less than the other companies.

All the companies saw their price earnings ratios grow as a result of the mergers. On average, in the year of the merger event, the P/E's of the three companies increased to over 300% what their averages had been in the early 1990's. Interestingly, all the companies had been trading at a discount P/E to the market in the 1990's, but were selling at premiums at the time of the merger/acquisition. The premiums decreased over time, but as of the end of 1996, each company was still selling at a higher P/E than its average for the years since 1990 prior to the merger. This suggests that investors' expectations for these companies have increased.

A noteworthy point that was gleaned from this analysis is that investors' increasing expectations for these companies (as evidenced by higher total returns and higher P/E's) occurred at the same time that relative measures of financial performance such as profitability were impacted negatively. This could be due partly to investors speculating on which company would be the next target in the wave of takeovers; probably it is a result of a conscious disregard for the short term difficulties these companies encountered as a result of consolidation and restructuring costs, and an acknowledgment by the collective market of increased long term prospects.

The companies that have engaged in mergers and acquisitions since 1993 have done so as a means of improving position within the industry by capturing economies of scale, while reducing costs through consolidation of redundant operations. Current industry philosophy says that a few healthy competitors are better than a large number of weakened competitors by offering a more efficient, lower cost, stable defense industrial base. In 1997, this philosophy remains in tact. Of the remaining companies, all are aggressively acquiring competitors and briskly consolidating operations in an attempt guarantee their future survival.

C. RECOMMENDATIONS FOR FUTURE RESEARCH

1. Under a major policy that began in 1994, the government has paid out billions of dollars to encourage rapid consolidation by offsetting restructuring costs. Has the government's funding of the drawdown in the industry made sense from a financial standpoint? Is it cost effective?

2. Has the consolidation in the defense industry allowed the remaining companies to gain greater pricing power with the government? Can a microeconomic analysis of the industry gain insight into the future of the industry?

3. How have these companies performed financially after 1996?

4. According to a Rand Corporation report, the last time America saw this type of defense consolidation was the 1930's, when the industry was also pared to a few large corporations. While the companies may have remained functional, innovation came to a standstill. Cutting edge ideas such as the all-metal mono wing fighters of World War II, the first supersonic jets, and the first stealth jets all came from second tier companies. With the elimination of this second tier of companies in the 1990's, has there been a negative impact on the development of new ideas for defense products?

APPENDIX. COMPOSITE RATIOS

The appendix shows calculations for the composite industry ratios that were used in this thesis. For each year from 1990-1995, the solvency, efficiency, and profitability ratios are shown for SIC's 3721 and 3812. Each ratio is further detailed by quartile.

On the far right is the composite ratio which is calculated using an equally weighted average of both industry codes. The result is a hybrid composite average—half SIC 3721 and half SIC 3812—that was used as a benchmark for this study. This composite was the number with which all financial ratios data were divided in order to create the standardized data tables in each chapter.

1990		3721			3812			Composite average		
Solvency	UQ	MED	LQ	UQ	MED	LQ	UQ	MED	LQ
Quick Ratio	1.4	0.7	0.5	2.2	1.1	0.6	1.8	0.9	0.55
Current Ratio	3.6	2	1.3	3.7	2.2	1.6	3.65	2.1	1.45
Curr Liab / Equity	34.6%	88.0%	110.8%	28.6%	65.4%	124.7%	31.6%	76.7%	117.8%
Curr Liab to Inventory	66.6%	96.2%	138.0%	49.7%	103.8%	173.7%	58.2%	100.0%	155.9%
Total Liab to Stkhldr Equity	38.1%	111.0%	182.0%	45.3%	98.0%	203.5%	41.7%	104.5%	192.8%
Fixed Assets to Stkhldr Equity	28.8%	57.3%	75.3%	15.9%	35.8%	73.0%	22.4%	46.6%	74.2%
Efficiency									
Collection Period	38.7	62.3	71.5	39	57	80.4	38.85	59.65	75.95
Sales / Inventory	10.4	5.9	3.8	11.6	5.5	3.9	11	5.7	3.85
Assets / Sales	45.3%	65.2%	78.9%	46.4%	60.4%	96.3%	45.9%	62.8%	87.6%
Sales / Net work cap	7.9	5.6	4.2	6.5	4.5	2.9	7.2	5.05	3.55
Accts Payable/Sales	5.3%	7.5%	9.7%	2.6%	5.1%	8.6%	4.0%	6.3%	9.2%
Profitability									
Profit Margin	7.8%	4.8%	2.0%	9.2%	4.2%	1.5%	8.5%	4.5%	1.8%
Return on Assets (ROA)	16.8%	7.3%	2.6%	10.7%	5.1%	1.1%	13.8%	6.2%	1.8%
Return on Equity (ROE)	18.6%	13.8%	7.0%	23.5%	9.2%	4.6%	21.1%	11.5%	5.8%
1991		3721			3812			Composite average		
Solvency	UQ	MED	LQ	UQ	MED	LQ	UQ	MED	LQ
Quick Ratio	1.2	0.7	0.3	1.9	1.2	0.6	1.55	0.95	0.45
Current Ratio	3.1	2.3	1.2	3.5	2	1.6	3.3	2.15	1.4
Curr Liab / Equity	45.5%	72.6%	124.4%	29.6%	76.1%	134.3%	37.6%	74.4%	129.4%
Curr Liab to Inventory	51.9%	78.0%	131.2%	58.1%	114.5%	210.7%	55.0%	96.3%	171.0%
Total Liab to Stkhldr Equity	76.0%	131.2%	218.1%	41.9%	117.5%	191.0%	59.0%	124.4%	204.6%
Fixed Assets to Stkhldr Equity	26.2%	54.6%	90.1%	18.7%	43.7%	74.7%	22.5%	49.2%	82.4%
Efficiency									
Collection Period	22.1	39.3	60.3	32.1	54.1	86.4	27.1	46.7	73.35
Sales / Inventory	7.3	4.1	2.5	15.1	6.1	3.9	11.2	5.1	3.2
Assets / Sales	51.1%	56.4%	71.7%	46.9%	65.6%	96.0%	49.0%	61.0%	83.9%
Sales / Net work cap	10.1	4.1	3.6	7	4.6	3	8.55	4.35	3.3
Accts Payable/Sales	4.3%	5.9%	9.3%	2.5%	5.1%	8.9%	3.4%	5.5%	9.1%
Profitability									
Profit Margin	5.9%	5.0%	1.3%	8.9%	2.5%	0.3%	7.4%	3.8%	0.8%
Return on Assets (ROA)	8.2%	4.3%	-0.4%	12.8%	3.3%	-1.2%	10.5%	3.8%	-0.8%
Return on Equity (ROE)	19.3%	10.4%	4.6%	27.7%	10.2%	-0.1%	23.5%	10.3%	2.3%

1992		3721			3812			Composite average		
Solvency	UQ	MED	LQ	UQ	MED	LQ		UQ	MED	LQ
Quick Ratio	1.6	0.8	0.3	2.1	1.1	0.7		1.85	0.95	0.5
Current Ratio	3.6	1.5	1.4	3.6	2.3	1.6		3.6	1.9	1.5
Curr Liab / Equity	39.4%	77.5%	128.8%	29.4%	63.4%	107.6%		34.4%	70.5%	118.2%
Curr Liab to Inventory	56.1%	83.8%	172.5%	63.3%	108.2%	192.7%		59.7%	96.0%	182.6%
Total Liab to Stkhldr Equity	95.0%	124.4%	166.6%	46.1%	92.0%	197.4%		70.6%	108.2%	182.0%
Fixed Assets to Stkhldr Equity	19.9%	48.1%	60.1%	15.2%	31.7%	70.9%		17.6%	39.9%	65.5%
Efficiency										
Collection Period	20.1	49.6	71.9	32.1	56.2	77.4		26.1	52.9	74.65
Sales / Inventory	7.1	4.7	2.2	11.2	5.9	3.6		9.15	5.3	2.9
Assets / Sales	45.8%	59.0%	92.8%	48.3%	68.9%	92.8%		47.1%	64.0%	92.8%
Sales / Net work cap	9.2	4.2	1.7	5.9	4.3	2.6		7.55	4.25	2.15
Accts Payable/Sales	5.4%	7.6%	9.9%	2.1%	4.5%	7.4%		3.8%	6.1%	8.7%
Profitability										
Profit Margin	7.4%	3.5%	1.6%	7.1%	2.8%	0.8%		7.3%	3.2%	1.2%
Return on Assets (ROA)	7.7%	6.0%	4.1%	9.7%	3.8%	0.3%		8.7%	4.9%	2.2%
Return on Equity (ROE)	24.3%	13.6%	10.3%	17.8%	10.1%	2.2%		21.1%	11.9%	6.3%

1993		3721			3812			Composite average		
Solvency	UQ	MED	LQ	UQ	MED	LQ		UQ	MED	LQ
Quick Ratio	1.6	1.3	0.7	2.1	1.2	0.7		1.85	1.25	0.7
Current Ratio	4	2.8	1.8	4.3	2.4	1.6		4.15	2.6	1.7
Curr Liab / Equity	28.0%	58.2%	106.6%	26.1%	51.2%	107.5%		27.1%	54.7%	107.1%
Curr Liab to Inventory	35.3%	72.2%	101.6%	55.8%	103.6%	210.8%		45.6%	87.9%	156.2%
Total Liab to Stkhldr Equity	46.4%	111.6%	157.9%	37.2%	88.5%	167.3%		41.8%	100.1%	162.6%
Fixed Assets to Stkhldr Equity	22.9%	49.1%	86.1%	13.3%	30.2%	71.7%		18.1%	39.7%	78.9%
Efficiency										
Collection Period	20	55.8	82.7	39.3	53.7	79.1		29.65	54.75	80.9
Sales / Inventory	6.3	5	2.3	14.8	5.5	3.8		10.55	5.25	3.05
Assets / Sales	45.9%	59.6%	93.9%	47.7%	67.1%	93.3%		46.8%	63.4%	93.6%
Sales / Net work cap	9.8	4	2.8	5.6	3.8	2.3		7.7	3.9	2.55
Accts Payable/Sales	2.8%	7.1%	12.7%	2.4%	4.9%	7.2%		2.6%	6.0%	10.0%
Profitability										
Profit Margin	6.8%	3.7%	2.2%	6.4%	2.9%	0.4%		6.6%	3.3%	1.3%
Return on Assets (ROA)	8.7%	4.8%	3.2%	10.2%	4.4%	0.4%		9.5%	4.6%	1.8%
Return on Equity (ROE)	12.7%	10.7%	7.3%	21.4%	8.1%	0.4%		17.1%	9.4%	3.9%

1994		3721			3812			Composite average		
Solvency	UQ	MED	LQ	UQ	MED	LQ		UQ	MED	LQ
Quick Ratio	0.9	0.5	0.3	2.1	1.2	0.7		1.5	0.85	0.5
Current Ratio	2.9	1.8	1.4	3.7	2.3	1.6		3.3	2.05	1.5
Curr Liab / Equity	33.1%	69.2%	132.7%	28.5%	55.9%	103.8%		30.8%	62.6%	118.3%
Curr Liab to Inventory	65.6%	89.8%	126.7%	59.2%	101.1%	191.0%		62.4%	95.5%	158.9%
Total Liab to Stkhldr Equity	43.8%	122.1%	396.3%	39.3%	86.0%	189.0%		41.6%	104.1%	292.7%
Fixed Assets to Stkhldr Equity	16.3%	43.0%	76.5%	19.9%	38.4%	77.5%		18.1%	40.7%	77.0%
Efficiency										
Collection Period	8	23.2	43.1	29.1	50.2	81.7		18.55	36.7	62.4
Sales / Inventory	8	4.2	2.4	11.5	6.2	4.1		9.75	5.2	3.25
Assets / Sales	38.9%	63.6%	112.7%	44.3%	65.6%	97.8%		41.6%	64.6%	105.3%
Sales / Net work cap	10.5	5.8	2.3	7.2	3.8	2.6		8.85	4.8	2.45
Accts Payable/Sales	2.7%	6.4%	9.5%	3.3%	5.4%	8.5%		3.0%	5.9%	9.0%
Profitability										
Profit Margin	5.4%	3.2%	-1.1%	7.7%	3.6%	1.3%		6.6%	3.4%	0.1%
Return on Assets (ROA)	9.0%	4.7%	3.1%	9.6%	5.1%	1.2%		9.3%	4.9%	2.2%
Return on Equity (ROE)	22.1%	15.9%	7.6%	24.6%	9.8%	2.0%		23.4%	12.9%	4.8%

1995		3721			3812			Composite average		
Solvency	UQ	MED	LQ	UQ	MED	LQ		UQ	MED	LQ
Quick Ratio	1.2	0.7	0.5	2.1	1.3	0.7		1.65	1	0.6
Current Ratio	4.9	1.6	1.4	4	2.5	1.5		4.45	2.05	1.45
Curr Liab / Equity	34.7%	73.2%	136.2%	25.2%	46.2%	100.6%		30.0%	59.7%	118.4%
Curr Liab to Inventory	56.8%	115.5%	142.2%	58.0%	115.1%	194.2%		57.4%	115.3%	168.2%
Total Liab to Stkhldr Equity	54.5%	121.3%	199.8%	33.0%	70.7%	162.2%		43.8%	96.0%	181.0%
Fixed Assets to Stkhldr Equity	16.7%	34.0%	57.0%	17.2%	37.3%	62.2%		17.0%	35.7%	59.6%
Efficiency										
Collection Period	27.8	44.7	99	37.8	55.1	84.5		32.8	49.9	91.75
Sales / Inventory	4.5	3.6	2.6	18.9	7	4.4		11.7	5.3	3.5
Assets / Sales	55.8%	86.9%	112.7%	50.6%	73.6%	101.9%		53.2%	80.3%	107.3%
Sales / Net work cap	8.5	5.9	2.9	6.9	3.6	2.3		7.7	4.75	2.6
Accts Payable/Sales	7.3%	9.4%	13.6%	2.8%	5.6%	8.3%		5.1%	7.5%	11.0%
Profitability										
Profit Margin	9.0%	4.5%	2.5%	7.0%	3.1%	0.3%		8.0%	3.8%	1.4%
Return on Assets (ROA)	8.9%	6.0%	2.1%	9.5%	3.9%	0.2%		9.2%	5.0%	1.2%
Return on Equity (ROE)	24.3%	10.4%	4.0%	19.2%	7.5%	0.1%		21.8%	9.0%	2.1%

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